EMC Test Report

Product Name: GPON Terminal

Product Model: EchoLife HS8245W

Report Number: SYBH(E)02666972EB

FCC ID: QISHS8245W

Reliability Laboratory of Huawei Technologies Co., Ltd.

(Global Compliance and Testing Center of Huawei Technologies Co., Ltd.)

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Tel: +86 755 28780808 Fax: +86 755 89652518

Notice

1. The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements.
   - The recognition number for the test site located in Shenzhen is 97456
   - The recognition number for the test site located in Shanghai is 684868.
   - The recognition number for the test site located in Chengdu is 216797.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements.
   - The recognition number for the test site located in Shenzhen is 6369A-1;
   - The recognition number for the test site located in Dongguan is 21741;
   - The recognition numbers for the test site located in Shanghai is 6369D, which contains 6369D-1 (3m chamber) and 6369D-2 (10m chamber).
   - The recognition number for the test site located in Chengdu is 6369E-1.
5. The laboratory has been listed by VCCI to perform electromagnetic emission measurements.
   - The recognition numbers for the test site located in Shenzhen are R-3892, G-415, C-4361, and T-1348.
   - The recognition numbers for the test site located in Dongguan are R-4344, G-946, C-4836 and T-2334.
6. The laboratory (Reliability Lab of Huawei Technologies Co., Ltd) is also named as “Global Compliance and Testing Center of Huawei Technologies Co., Ltd”; the both names have coexisted since 2009.
7. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
8. The test report is invalid if there is any evidence of erasure and/or falsification.
9. The test report is only valid for the test samples.
10. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name:	GPON Terminal
Product Model:	EchoLife HS8245W

Date of Receipt Sample:	2016-11-09
Start Date of Test:	2016-11-10
End Date of Test:	2016-11-12

Test Result: Pass

Approved by Senior Engineer:	2016-11-16	Ren Huasheng	Ren Huasheng
	Date	Name	Signature

Prepared by:	2016-11-15	Wang Ying	Wang Ying
	Date	Name	Signature

Modification Record

No.	Last Report No.	Modification Description
1	N/A	First report

Content

1 General Information

1.1 Applied Standard	
Applied Product Standard:	FCC CFR47 Part 15 Subpart B:2015 ICES-003 Issue 6:2016
Test Method:	ANSI C63.4:2014
1.2 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
1.3 Test Environment Condition	
Ambient Temperature:	20-25°C
Relative Humidity:	45-55%
Atmospheric Pressure:	101kPa

2 Summary of Test Results

Table 1 Test summary

EUT Classification: Class B Digital Device				
Test Items	Test Configuration	Limit	Test Result	Location
Radiated Emissions Enclosure Port	TC1-TC2	Class B	Pass	Location1
Conducted Emissions AC Power Port	TC1-TC2	Class B	Pass	Location1
Note: 1, Measurement taken is within the uncertainty of measurement system. 2, TC is short for test configuration				

3 Equipment Specification

3.1 General Description

The EchoLife HS8245W GPON terminal (hereinafter referred to as HS8245W) is an indoor optical network terminal (ONT) designed for home users and small office. The HS8245W uses the gigabit-capable passive optical network (GPON) technology to provide a high-speed data channel with an upstream rate of 1.244 Gbit/s and a downstream rate of 2.488 Gbit/s through a single optical fiber. In this way, you can use the HS8245W to enjoy the high-speed data service, quality voice service, superior video service, and secure and reliable wireless access service.
As a network terminal, the HS8245W is deployed at the GPON access layer and connects the home users to the Internet through the optical upstream port. On the local area network (LAN) side, the HS8245W provides abundant hardware ports to meet multiple networking requirements of home users.

- Four 10/100/1000 Base-T Ethernet ports that can function as the service ports for service terminals such as PC, set top box (STB), and video phone.
- Two TEL ports that provide superior and cost-effective voice over IP (VoIP), fax over IP (FoIP), and modem over IP (MoIP) services.
- Two WLAN port to support a secure and reliable high-speed wireless network.
- Two USB port that can be attached with USB disks to provide convenient home network attached storage and file sharing services.

Products may have different colors, antennas and silkscreens. The following shows an example.

3.2 Specification

Table 2 Main equipment specification

Rated Input Voltage	Adapter: ~100-240V AC, 50/60Hz
Rated Power (W)	≤36W
Dimensions (W x D x H)	295 mm (W) x 180 mm (D) x 82 mm (H)
Weight (kg)	0.6 kg
Frequency of the Internal Source (Hz)	25 MHz, 40 MHz, 125 MHz, 480 MHz, 1.244 GHz, 2.488 GHz, 5.8 GHz

Figure 1. EUT Appearance

Figure 1.EUT appearance of HW-120300U3W(HuntKey)

Figure 2.EUT appearance of HW-120300U3W(Fuhua)

3.3 Board and Subassembly

Table 3 Board list

Board	
Board Name	Description
HG8245WA01	PON, GE, POTS, USB, WIFI

Table 4 Subassembly list

Subassembly			
Subassembly Name	Model	Manufacturer	Description
Adapter	HW-120300U3W	Shenzhen Huntkey Electric Co., Ltd	Input voltage : ～ 100V-240V, 50/60Hz 1A Output voltage : ⎓ 12 V 3A
	HW-120300U3W	Dongguan Shilong Fuhua electronic Co.,Ltd	Input voltage : ～ 100V-240V, 50/60Hz 1A Output voltage : ⎓ 12 V 3A

4 System Configuration during EMC Test

The Equipment under Test (EUT) was functioning correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical configuration.

4.1 Ports and Cables

Table 5 Ports and cables

Port	Quantity	Length (m)	Connector	Type of Cable
AC Power Port	1	1.5	NA	Unshielded
POTS	2	5	RJ11	UTP-CAT3
GE	4	10	RJ45	UTP-CAT5
PON	1	10	SC	Fiber

4.2 Auxiliary Equipment

Table 6 Auxiliary equipment

Name	Model	Manufacturer	S/N	Calibration Date	Cal Interval (month)
TELEPHONE	TCL 37	TCL	N/A	N/A	N/A
Data network analyzer	Smartbits600	Spirent	SZ0500038070	2016-04-28	12
PC	Lenovo M4000	LEGEND	N/A	N/A	N/A
OLT	MA5603T	Huawei	N/A	N/A	N/A
USB memorizer	N/A	Kingston	N/A	N/A	N/A
Notebook PC	HP 2540p	HP	3105033009	N/A	N/A

4.3 Test Configurations

The equipment under test (EUT) was connected to ancillary devices in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment). There were two test configurations. TC1 and TC2 were shown in the following table and figure:

Table 7 Test configuration

Configuration	Configuration Description	
TC1	Adapter(Fuhua)	HW-120300U3W
TC2	Adapter(HuntKey)	HW-120300U3W

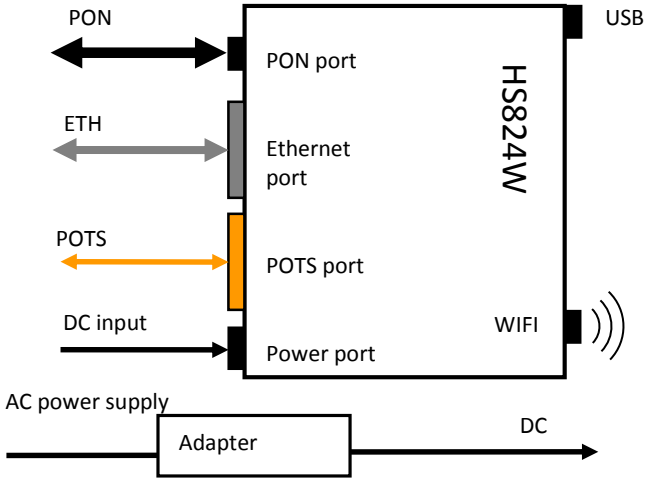


Figure 3. : Test configuration

4.4 Test Conditions and Connections

The HS8245W was connected with the OLT through a single-mode optical fiber and 15–20 dB optical attenuation is added. The Ethernet ports of HS8245W should connect to the SmartBits600. The data flow rates of each Ethernet port is nearly 900M when the Ethernet port is GE. Data transmission is normal at the Ethernet port with no packet loss or error codes. Each POTS port of HS8245W should connect with a phone. Voice service was configured on the board so that voice connection can be built between phone1 and phone2.

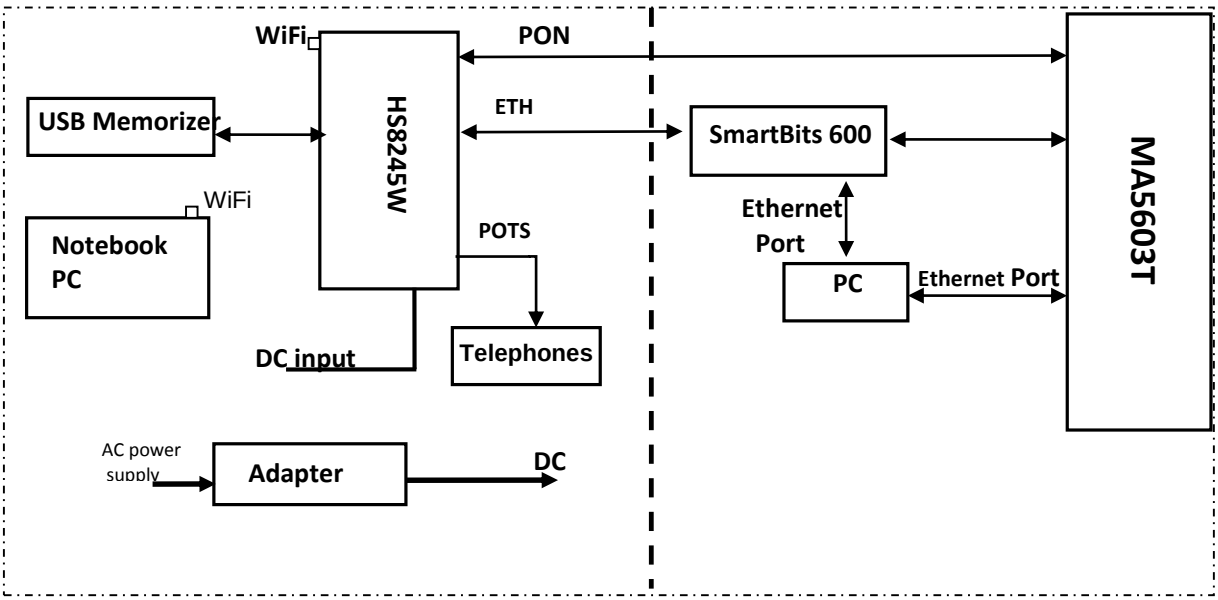


Figure 4. Test connection

5 Details of Test Items

5.1 Radiated Emission 30 MHz to 40 GHz

5.1.1 Test Procedure

The test site semi-anechoic chamber for 30MHz to 1GHz test has met the requirement of NSA tolerance 4 dB according to the standard ANSI C63.4. The test distance was 3m.The set-up and test methods were according to ANSI C63.4.

The test site full-anechoic chamber for above 1GHz test has met the requirement of S_{VSWR} tolerance 6 dB in accordance with the standard ANSI C63.4. The test distance was 3 m for above 1GHz.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 40 GHz by using test script of software; the emissions were measured using Quasi-Peak Detector for 30 MHz to1 GHz, Average and Peak detector for above 1 GHz. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1 m to 4 m, the azimuth range of turntable was 0°to 360°, The receive antenna has two polarizations V and H.

The test set-up is shown in diagram as below:

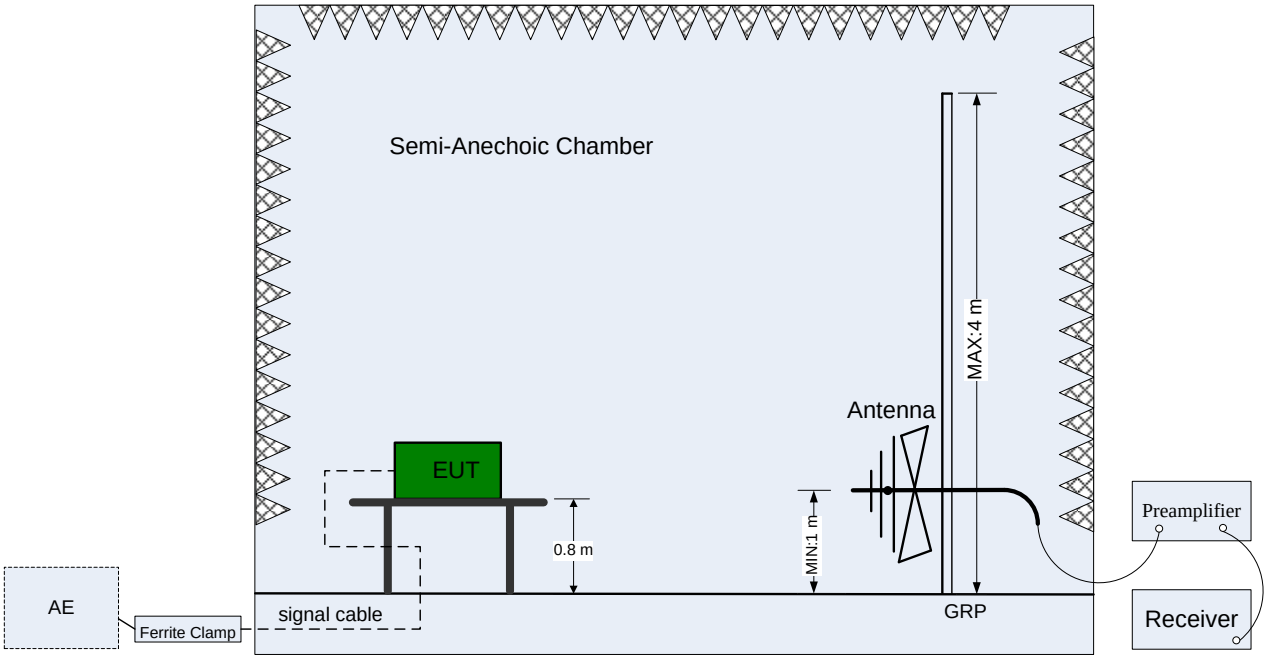


Figure 5. Test set-up of radiated disturbance (30 MHz-1 GHz)

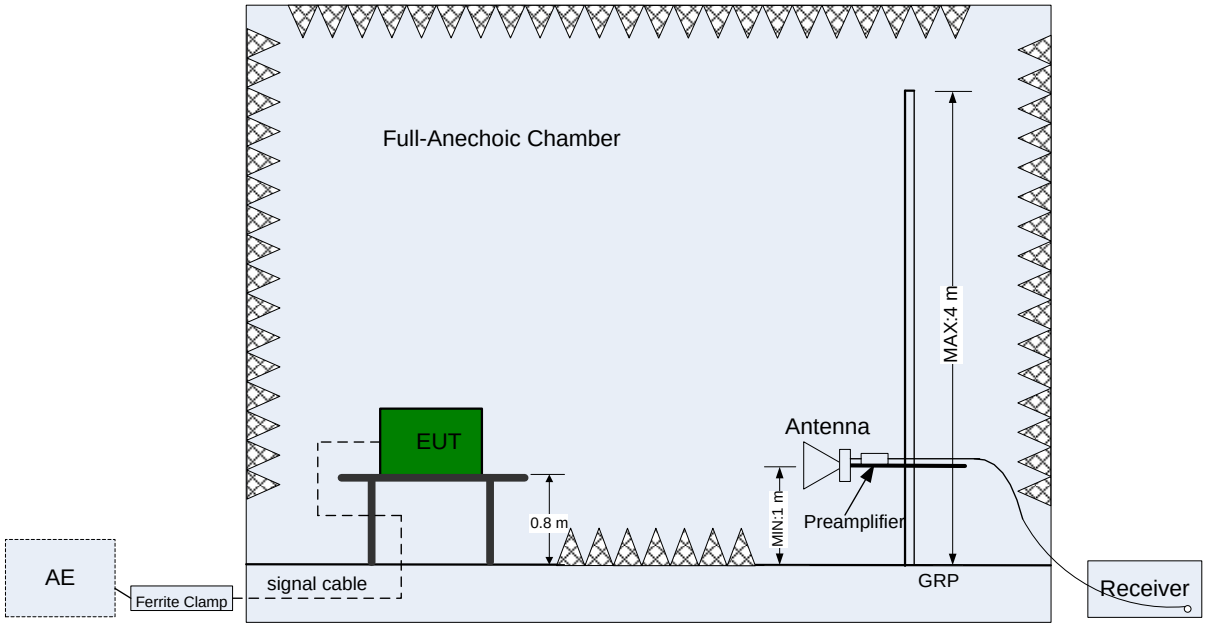


Figure 6. Test set-up of radiated disturbance (above 1 GHz)

5.1.2 Test Results

The EUT has met the requirements for radiated emission of enclosure port.
For the test data, see section 8.1.

Table 8 Test limits for 30MHz to 1GHz at a measuring distance of 3m

Frequency range	30 MHz to 1 GHz	
Measuring distance	3 m	
Classification	Class B	
Limits(Class B)	30 MHz to 88 MHz	40.0 dBµV/m
	88 MHz to 216 MHz	43.5 dBµV/m
	216 MHz to 960 MHz	46.0 dBµV/m
	960 MHz to 1 GHz	53.9 dBµV/m

Table 9 Test limits for 1GHz to 18GHz at a measuring distance of 3m

Frequency range	1 GHz to 18 GHz	
Measuring distance	3 m	
Classification	Class B	
Limits(Class B)	AV Detector	PK Detector
	53.9 dBµV/m	73.9 dBµV/m

Table 10 Test limits for 18GHz to 26.5GHz at a measuring distance of 3m

Frequency range	18 GHz to 26.5 GHz	
Measuring distance	3 m	
Classification	Class B	
Limits(Class B)	AV Detector	PK Detector
	53.9 dBµV/m	73.9 dBµV/m

Table 11 Test limits for 26.5GHz to 40GHz at a measuring distance of 1m

Frequency range	26.5 GHz to 40 GHz	
Measuring distance	1 m	
Classification	Class B	
Limits(Class B)	AV Detector	PK Detector
	63.4 dBµV/m	83.4 dBµV/m

Note: The highest frequency of the internal sources of the EUT is 5.8 GHz, the measurement was made up to 40 GHz.

5.2 Conducted Disturbance 0.15 MHz to 30 MHz

5.2.1 Test Procedure

The EUT was configured as described in section 4. The mains cable of the EUT must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

The test set-up is shown in diagram as below:

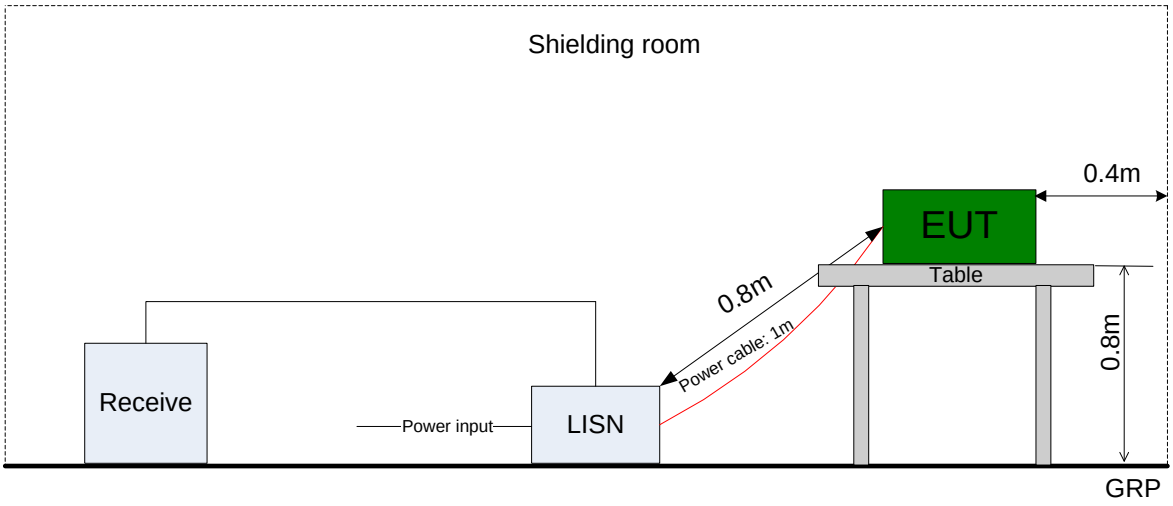


Figure 7. Test set-up of conducted disturbance for AC power port

5.2.2 Test Results

The EUT has met the requirements of FCC Part15 and ICES 003 for Conducted Disturbance of AC Power Port
For the test data, see section 8.2

Table 12 Limits of AC power port

Frequency range	150 kHz to 30 MHz	
Classification	Class B	
Limit(Class B)	Voltage limits (dBµV)	
	QP	AV
0.15 to 0.5 MHz	66 to 56	56 to 46
0.5 to 5 MHz	56	46
5 to 30 MHz	60	50

6 Main Test Instruments

Table 13 Main test instrument

Test Item	Test Instrument	Model	Manufacturer	Calibration Date	Calibration Interval (Month)
Radiated emission (3m chamber)	EMI test receiver	ESU40 (100144)	R&S	2016-06-24	12
	Bilog antenna	CBL 6112B (2941)	Schaffner	2016-08-24	24
	Horn antenna	HF906 (359287/006)	R&S	2016-08-20	24
	Horn antenna (18 to 26.5GHz)	3160-9 (053215-21876)	ETS-LINDGREN	2016-03-26	24
	Horn antenna (26.5 to 40GHz)	3116 (00031542)	ETS-LINDGREN	2015-03-31	24
	Chamber _NSA	3m chamber	Albatross	2015-03-27	24
	Chamber _S_{VSWR}	3m chamber	Albatross	2015-08-25	24
Conducted emission	EMI test receiver	ESCI (100929)	R&S	2016-05-19	12
	Artificial mains network	ENV4200 (100046)	R&S	2016-03-16	12

Software Information			
Test Item	Software Name	Manufacturer	Version
Radiated emission (3m chamber)	ES-K1	R&S	V1.7.1
Conducted emission	ES-K1	R&S	V1.7.1

7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Table 14 System measurement uncertainty

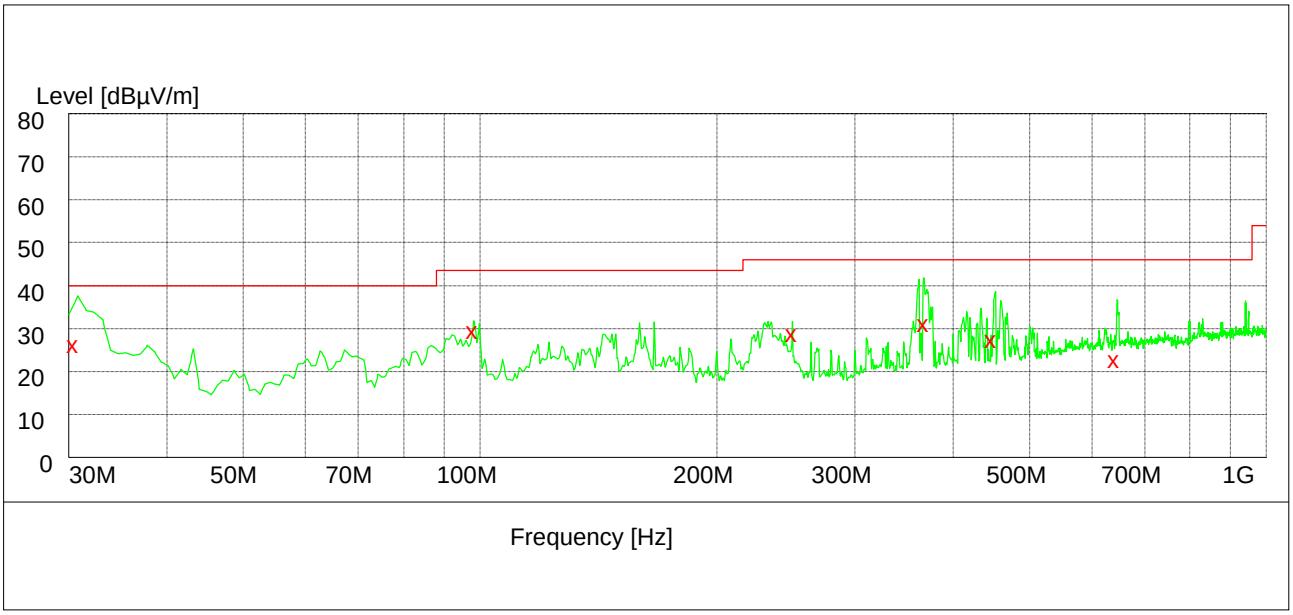
Items		Extended Uncertainty
Radiated emission (3m chamber)	Field strength (dBμV/m)	U=4.15 dB; k=2 (30 MHz-1 GHz)
		U=3.64 dB; k=2 (1 GHz-18 GHz)
		U=3.26 dB; k=2 (18 GHz-26.5 GHz)
		U=3.83 dB; k=2 (26.5 GHz-40 GHz)
Conducted Emission	Disturbance Voltage (dBμV)	U=3.3 dB; k=2

8 Graph and Data of Emission Test

8.1 Radiated Disturbance

8.1.1 Radiated Disturbance of TC1 for 30MHz-1GHz

Graph of Test result (30 MHz-1 GHz)



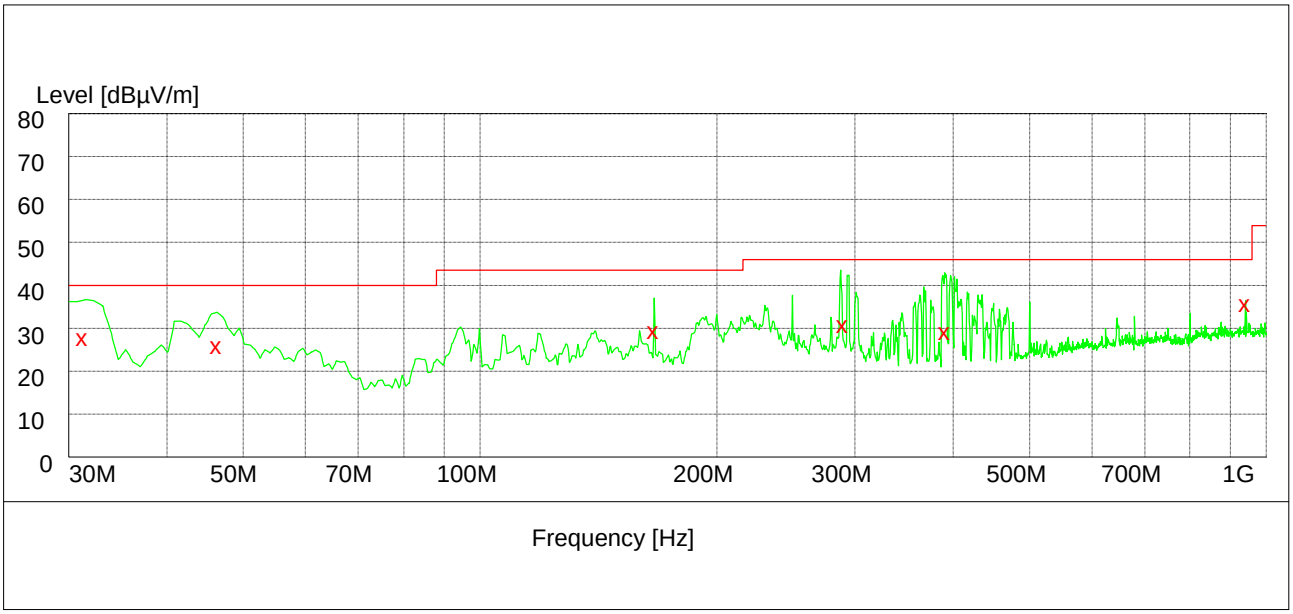
Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
30.540000	27.90	-5.0	40.0	12.1	100.0	214.00	VERTICAL
98.280000	31.00	-12.6	43.5	12.5	200.0	145.00	HORIZONTAL
250.020000	30.20	-9.3	46.0	15.8	100.0	238.00	HORIZONTAL
367.860000	32.60	-5.7	46.0	13.4	171.0	242.00	VERTICAL
448.320000	28.90	-4.7	46.0	17.1	105.0	197.00	VERTICAL
642.540000	24.20	-1.5	46.0	21.8	147.0	225.00	HORIZONTAL

Note:
Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.

8.1.2 Radiated Disturbance of TC2 for 30MHz-1GHz

Graph of Test result (30 MHz-1 GHz)



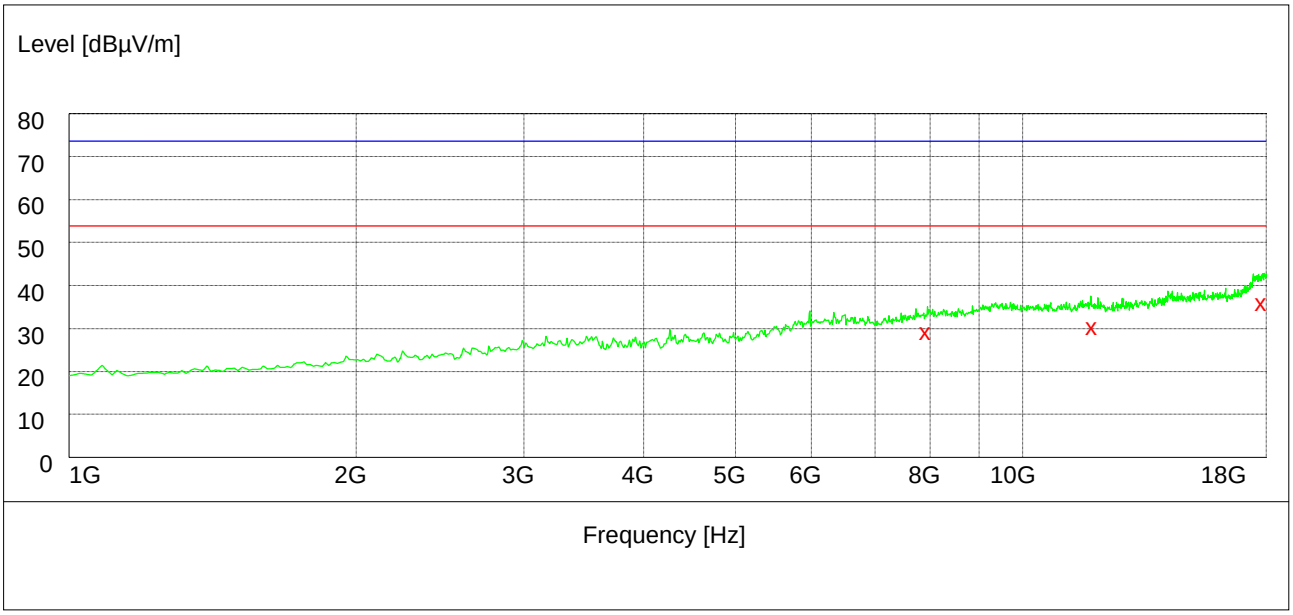
Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
31.320000	29.30	-5.6	40.0	10.7	112.0	61.00	VERTICAL
46.440000	27.30	-15.0	40.0	12.7	100.0	278.00	VERTICAL
166.680000	30.90	-12.4	43.5	12.6	168.0	150.00	HORIZONTAL
290.400000	32.40	-8.5	46.0	13.6	161.0	253.00	HORIZONTAL
391.800000	30.80	-4.8	46.0	15.2	174.0	360.00	HORIZONTAL
943.620000	37.40	2.9	46.0	8.6	100.0	204.00	HORIZONTAL

Note:
Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.

8.1.3 Radiated Disturbance of TC1 and TC2 for 1GHz - 40GHz

Graph of Test result (1 GHz-18GHz)

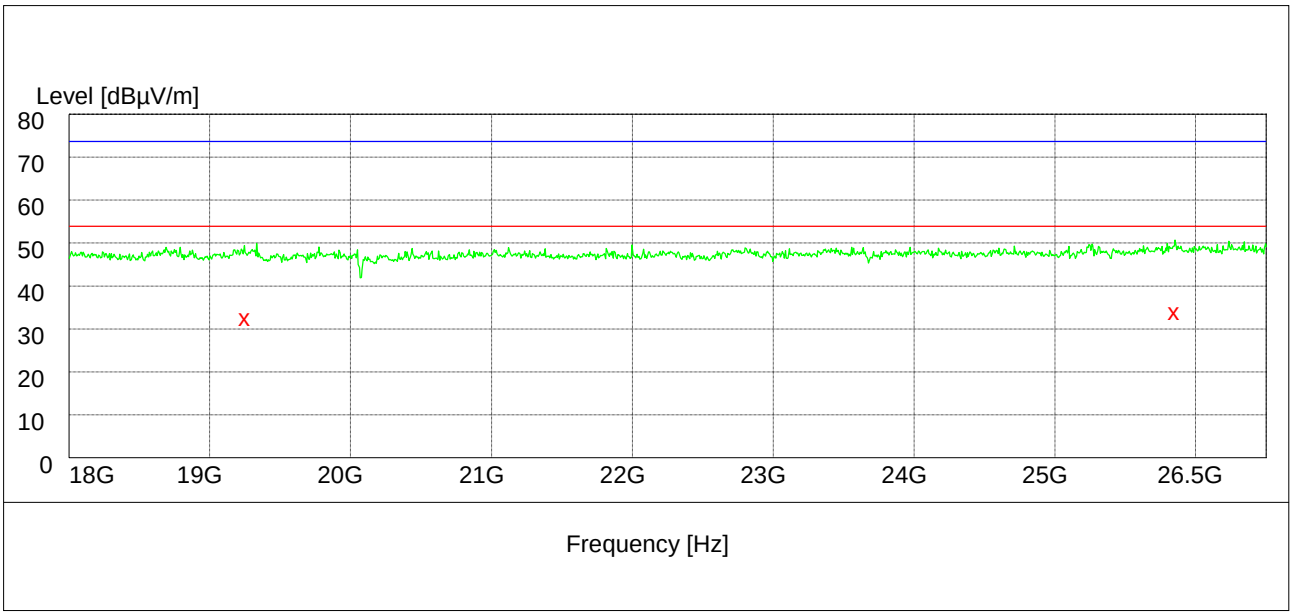


Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
7932.000000	30.80	8.1	53.9	23.1	166.0	180.00	HORIZONTAL
11859.00000	31.90	14.2	53.9	22.0	200.0	299.00	HORIZONTAL
17822.00000	37.40	25.6	53.9	16.5	159.0	184.00	VERTICAL

Note:
1. Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.
2. The test configurations TC1 and TC2 were tested, but the worse test result was supplied.

Graph of Test result (18 GHz-26.5GHz)

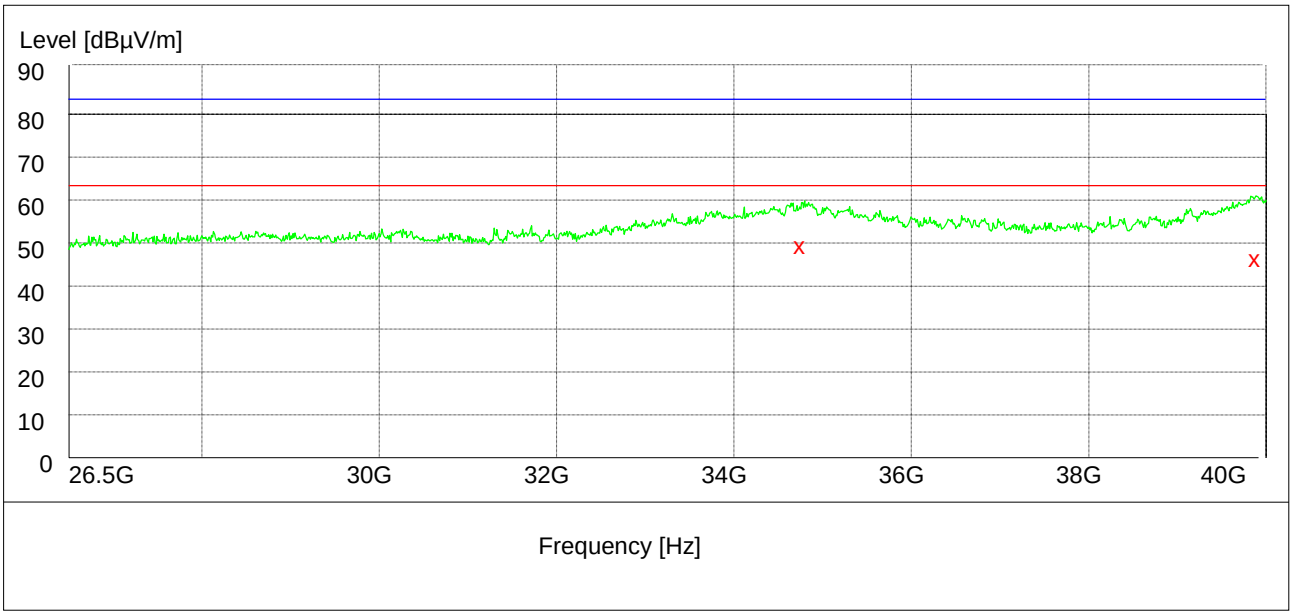


Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
19261.50000	34.10	-0.9	53.9	19.8	160.0	310.00	VERTICAL
25855.00000	35.60	3.4	53.9	18.3	157.0	13.00	VERTICAL

Note:
1. Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.
2. The test configurations TC1 and TC2 were tested, but the worse test result was supplied.

Graph of Test result (26.5 GHz-40GHz)



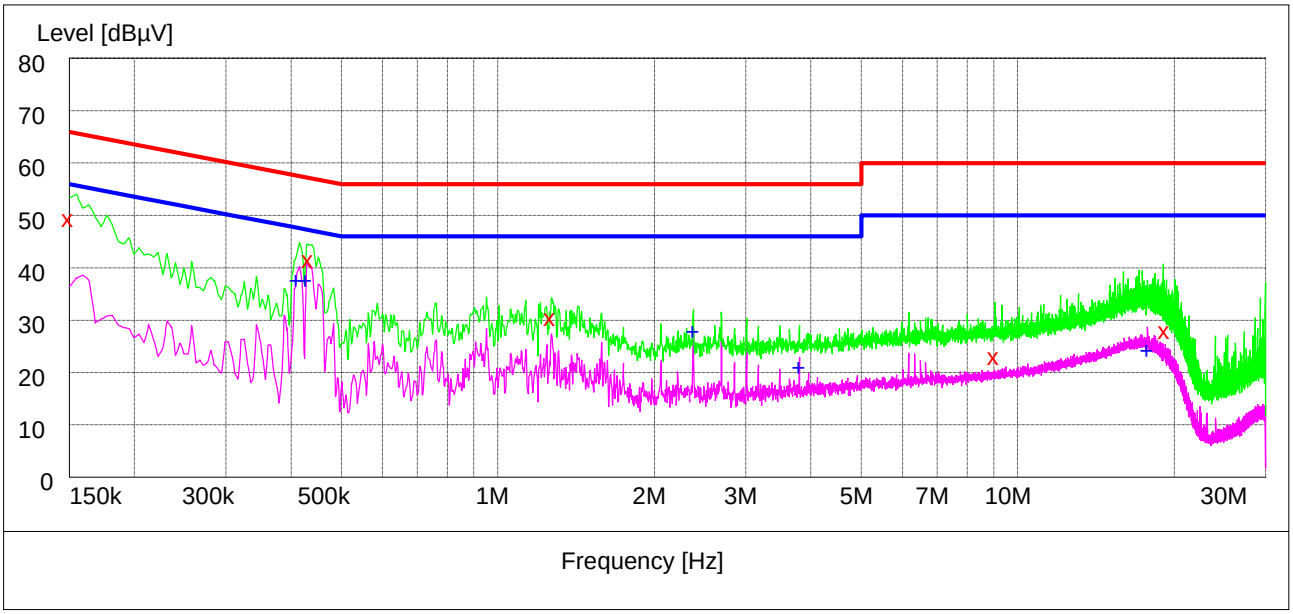
Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
34758.00000	51.00	39.0	63.4	12.4	169.0	21.00	HORIZONTAL
39893.00000	47.90	37.7	63.4	15.5	200.0	240.00	VERTICAL

Note:
1. Margin=Limit-Level
Level =Reading level by receiver + Transd (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.
2. The test configurations TC1 and TC2 were tested, but the worse test result was supplied.

8.2 Conducted Disturbance

8.2.1 AC Power Port Test Data of TC1



Measurement Result: QP Detector

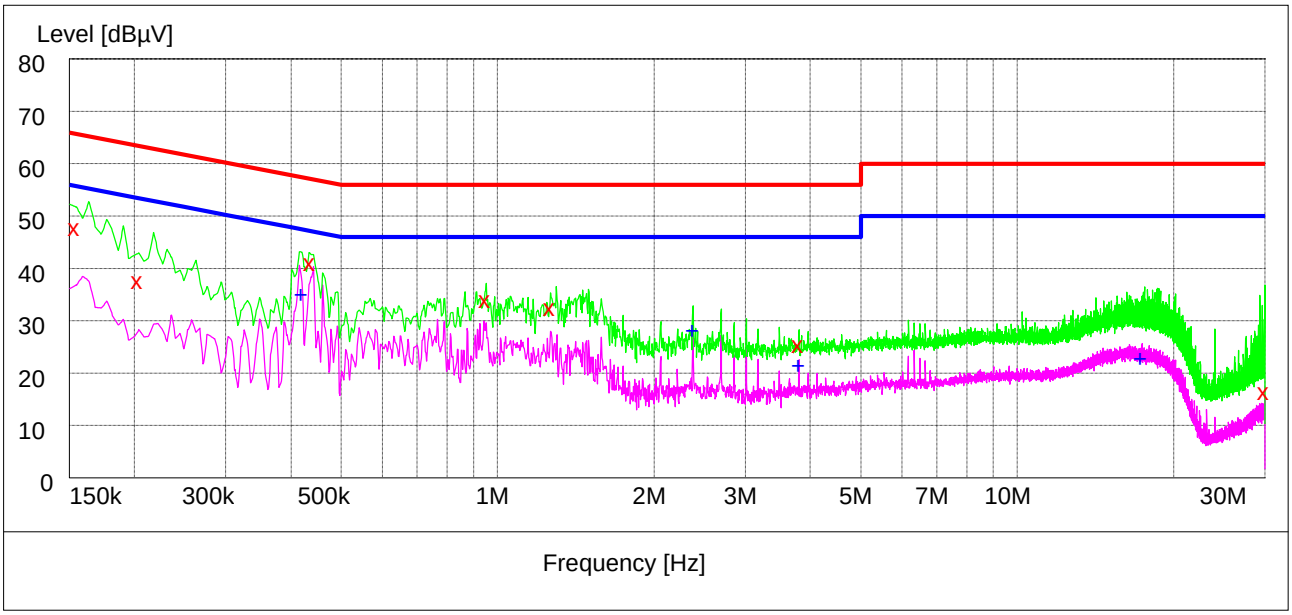
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	50.30	9.9	66	15.7	L3	FLO
0.433500	42.60	10.1	57	14.6	N	FLO
1.270500	31.40	10.2	56	24.6	N	FLO
9.055500	24.00	10.7	60	36.0	N	FLO
19.216500	29.00	10.8	60	31.0	L3	FLO

Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.411000	38.40	10.1	48	9.2	N	FLO
0.429000	38.50	10.1	47	8.8	L3	FLO
2.377500	28.80	10.3	46	17.2	L3	FLO
3.804000	21.90	10.3	46	24.1	N	FLO
17.785500	25.00	10.8	50	25.0	N	FLO

Note:
Level= Reading level+ Transd (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

8.2.2 AC Power Port Test Data of TC2



Measurement Result: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.154500	48.80	9.9	66	17.0	L3	FLO
0.204000	38.60	10.0	63	24.8	L3	FLO
0.438000	42.00	10.1	57	15.1	L3	FLO
0.951000	35.10	10.2	56	20.9	N	FLO
1.270500	33.50	10.2	56	22.5	N	FLO
3.804000	26.40	10.3	56	29.6	N	FLO
29.976000	17.50	11.1	60	42.5	L3	FLO

Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.420000	35.80	10.1	47	11.6	N	FLO
2.377500	28.90	10.3	46	17.1	L3	FLO
3.804000	22.30	10.3	46	23.7	N	FLO
17.317500	23.70	10.8	50	26.3	L3	FLO

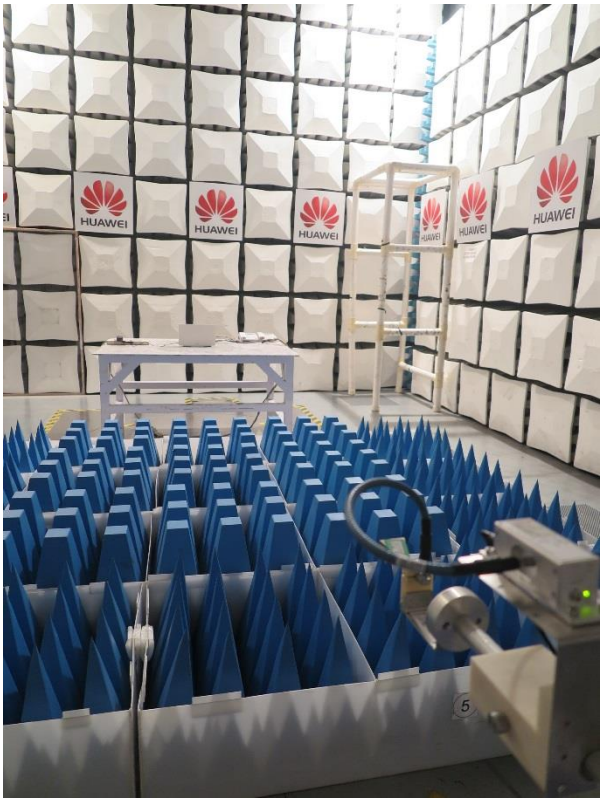
Note:
Level= Reading level+ Transd (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

9 Photographs of Test Set-up

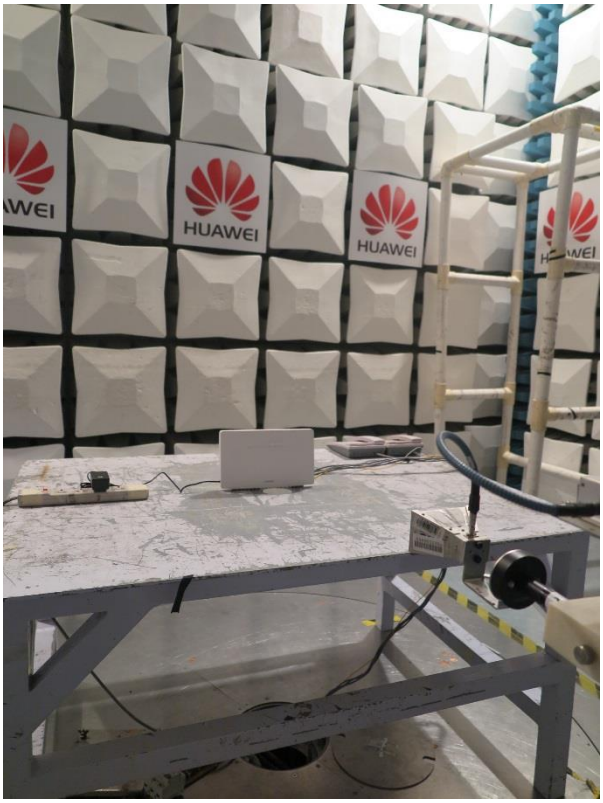
9.1 Radiated Emission

Radiated emission for 30 MHz-1 GHz

Radiated emission for 1GHz to 18GHz



Radiated emission for 18GHz to 26.5GHz



Radiated emission for 26.5GHz to 40GHz

9.2 Conducted Emission

Conducted emissions of AC power port

Appendix: Abbreviation

Table 15 Abbreviation

Abbreviation	Full Name
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EUT	Equipment Under Test
AE	Auxiliary Equipment
AC	Alternate Current
DC	Direct Current
NSA	Normalized Site Attenuation
S_{VSWR}	Site Voltage Standing Wave Ratio
LISN	Line Impedance Stabilization Network
TC	Test configuration
N/A	Not Applicable

END